UCRL-JC-121497 Abs

Abstract for an invited talk at the
thirty-seventh annual APS meeting
of the Division of Plasma Physics
November 6-10, 1995, Louisville, KY

Large Rayleigh-Taylor Growth, Indirectly-Driven Implosions at Nova*

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The performance of indirectly-driven capsules in inertial confinement fusion is determined by the level of x-ray drive spatial uniformity, the degree of isentropy achieved during compression and the level and nature of hydrodynamically unstable growth of capsule imperfections. Implosions hydrodynamically equivalent on a smaller scale to those expected of ignition target designs have been fielded[1] at the Nova laser as an integrated test of the third topic, that is large Rayleigh-Taylor growth rates in convergent geometry. The target designs have achieved large linear growth factors, ≈ 150 at mode 20, by using a low isentrope shaped drive and by using mid-Z doped ablators providing hard x-ray preheat shielding. The experiments have recorded the neutron yields and inferred fuel areal densities as a function of pre-imposed capsule surface roughness and ablator doping level. The preheat shielding, as expected, increases susceptibility to Rayleigh-Taylor growth while improving performance for smooth capsules. Using the measured time-resolved drive and drive spectra, the yield degradation versus surface roughness are modeled using 1D atomic mix, 2D and 3D multimode hydrodynamic simulations. Effects of drive non-uniformities, visible on the imploded core x-ray images, are also included in the hydrodynamic simulations.

*Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract number W-7405-ENG-48.

#In collaboration with C.J. Keane, T.J. Murphy, D.H. Kalantar, R.G. Hay, R.A. Lerche, M.B. Nelson, M.D. Cable, B.A. Hammel, B.A. Remington, J.D. Kilkenny, P. Amendt, J.D. Colvin, T.R. Dittrich, W.K. Levedahl, L. Suter, S.W. Haan, S.P. Hatchett, R. McEachern, R. Cook, and R.J. Wallace.

[1] O.L. Landen*et al.*., to be published in J.Q.S.R.T. (1995).